

IMP. BUR.
16 JUN. 1927
ENTOM.

The Florida Entomologist

Official Organ of the Florida Entomological Society

Vol. XI

SPRING NUMBER
APRIL, 1927

No. 1

LIFE HISTORIES OF LADY-BEETLE PREDATORS OF THE CITRUS APHID

By R. L. MILLER AND W. L. THOMPSON

(Continued from Vol. X, No. 4, p. 59)

THE BLOOD-RED LADYBEETLE

(*Cylonedra sanguinea immaculata*) (Fab.)

Description.—The adult lady beetle (Fig. 1a) is red or orange in color with a black prothorax and head. The legs are black. The eggs are cigar shaped, yellow in color and placed on end in clusters of from 7 to 20 on the underside of the leaf. The larvae (Fig. 1c) are dark blue or black with orange markings and black head and legs. The pupa (Fig. 1b) are deep yellow or orange with six small black spots.

The natural food of this insect is aphids. It has been known to thrive on the melon aphid, *Aphis gossypii*, *Myzus persicae* and *Aphis spiraecola*. It frequently is found on aphids on turnip and cabbage but is usually not abundant there.

The eggs are usually laid on a fairly large leaf somewhere near an aphid colony. The larvae hatch in four or five days and begin active feeding. They were found to eat an average of sixteen aphids per day.

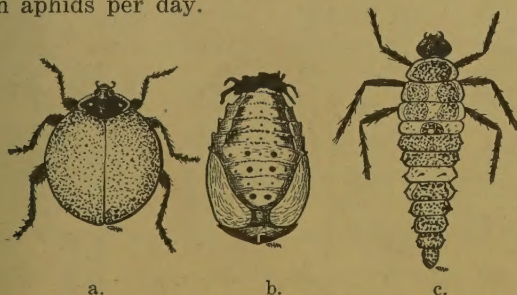


Fig. 1.—Blood-red lady-beetle. (From Bul. 183, Fla. Agri. Exp. Sta.)

The length of time required for a beetle to complete its life cycle differs with the time of year and the temperature. One female emerged April 2, and was placed in a cage April 3 with a male collected from the field. They mated at once and the female deposited 19 eggs April 10. These eggs hatched April 17. From eggs deposited on April 13 by another beetle adults emerged May 7 or 24 days later. Taking 24 days for the period between the deposition of eggs and the emerging of adults and eight days from emergence to the egg laying period (preoviposition period), the complete life cycle would be approximately 32 days.

The larvae have been observed to molt three times. Larvae that were hatched out May 18 molted May 21, May 24, and May 28.

The following tables give records of egg laying and the life cycles respectively.

EGG LAYING RECORD OF SIX INDIVIDUAL FEMALES

Period 1925	No. Egg Masses	Total No. of Eggs	Ave. Per Day	Max. Eggs Per Mass	Min. Eggs Per Mass
3-13 to 3-28.....	9	144	9.6	21	7
3-30 to 4-18.....	9	145	7.0	34	6
3-29 to 4-20.....	23	204	8.4	19	3
3-28 to 4-15.....	7	48	2.5	11	4
3-12 to 3-17.....	6	60	12.0	21	7
*6-14 to 6-30.....	15	154	9	18	4

*This female was collected from the grove for feeding experiment, June 8. She was placed in an individual cage, no male present. Larvae hatched out of eggs in each egg mass recorded.

LENGTH OF LIFE CYCLE OF BLOOD-RED LADY-BEETLE

Egg Deposited	Egg Hatched	No. of Days	Larvae Pupated	Days Larvae Stage	Adult Emerg	Days in Pupa Stage	No. Days in Life Cycle
3-16	3-20	4	4-20	31	4-26	6	41
3-20	3-24	4	4-27	34	5-3	6	44
3-30	4-7	7	4-26	19	4-30	4	30
4-13	4-17	4	4-30	13	5-7	7	24
4-22	4-26	4	5-12	16	5-17	5	25
5-25	5-28	3	6-7	10	6-15	8	21
6-4	6-7	3	6-16	9	6-21	5	17
10-19	10-23	5	11-3	20	11-10	7	32
10-20	10-24	5	11-10	17	11-16	6	28

These eggs were collected from groves so dates of egg deposition are estimated.

IMPORTANCE AS DESTROYERS OF THE CITRUS APHID

As was reported previously by Professor J. R. Watson this is the most common and abundant of all aphid predators. It occurs during the entire year and in the periods of heavy in-

festation is very abundant. During its period of greatest abundance as many as 5 larvae could be found per 1000 aphids. This number is not sufficient to destroy all the aphids but will greatly reduce their numbers.

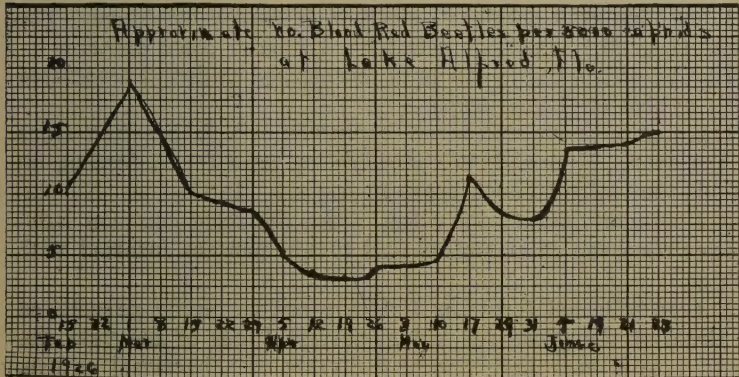


Fig. 2.—Table showing seasonal appearance and abundance.

Enemies.—If it were not for the natural enemies of this predator it would probably become much more abundant. The hymenopterous parasites reared from this insect were *Tetrastichus blephyrus* and *Homalotylus terminalis* Say. These were found during the spring and early summer of 1925 and during the same period in 1926. They destroyed as many as 50 percent of the larvae. During the rainy season a disease caused by a fungus, *Cladisporium* sp. attacked the larvae. A bacterial disease also played havoc during the rainy season. This disease caused the full grown larvae to turn black and die instead of pupating.

CONVERGENT LADYBEETLE

Hippodamia convergens Guer.



Fig. 3.—(From Bull. 183, Fla. Agr. Exp. Sta.)

Description.—The adult (Fig. 3c) is light red in color with 12 black spots on the wing covers, six spots on each cover. The prothorax is black with two diagonal white lines, the head and feet are black. The eggs are cigar shaped, yellow in color and laid in clusters of 5 to 20 on leaves or twigs. The larvae (Fig. 3a) are blue gray or almost black with orange markings. The pupa (Fig. 3b) is orange colored with many black spots.

Habits.—This beetle can most frequently be found associated with aphids on truck crops.

It seems to thrive well when feeding on aphids infesting crops in the open. Hundreds of these beetles were found feeding on aphids that infested crab grass in August. In October, November, December and January they were the most common lady-beetles observed in cucumber and turnip patches infested with aphids.

Larvae collected from the field are not as highly parasitized as those of the Blood-red but at certain times of the year the death rate is very high due to a disease of a bacterial nature. In the life history work the death rate was very high from this disease.

The complete life cycle takes about 30 days in April and May. A male and female emerged April 13 and mated April 14. The first lot of eggs was deposited April 18 and hatched April 22, the adults emerging May 12 or 29 days for one generation. The following table gives the egg record for one female, the molts and length of time of larvae and pupae stages.

Lot	Eggs Dep. 1925	No. Eggs	Eggs Hatch	No. Eggs Hatched	Molts			Date	No.	Adults	No.	Died
					1st	2nd	3rd	Larvae Pupated		Emerged		
1	4-18	*	---	---	---	---	---	---	---	---	---	---
2	4-18	14	4-22	14	4-24	4-25	4-29	5-5	2	5-12	2	0
3	---	---	---	---	---	---	---	5-6	7	5-12	7	0
3	4-21	7	---	---	---	---	---	---	---	---	---	---
4	4-22	17	4-24	?	?	?	?	5-10	---	5-15	---	---
5	5-7	14	5-10	---	---	---	---	---	---	---	---	10
6	5-8	10	5-11	7	5-13	5-15	5-18	5-24	2	5-29	1	6
7	5-15	16	5-18	11	5-20	5-22	5-25	5-3	4	6-3	4	7
8	5-16	14	5-20	7	5-22	5-24	5-27	5-30	1	6-5	1	6
8	5-16	14	5-20	7	5-22	5-24	5-27	5-30	1	6-5	1†	6
9	5-18	23	5-24	15	?	?	?	---	---	---	---	---

NOTES: *Adult ate eggs. †Adult that emerged was not normal, wings deformed. All other larvae of lot 9 died of disease.

The eggs are usually laid in clusters on the under side of the leaves near aphid colonies. The larvae begin feeding immediately after hatching and ate an average of 58 aphids per day.

The adults are very active, strong flyers and travel from truck patches to groves near by.

IMPORTANCE IN DESTROYING THE CITRUS APHID

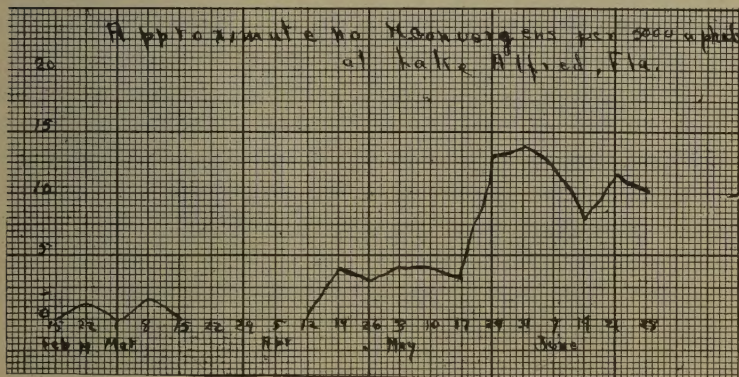


Fig. 4.—Chart Showing Seasonal Appearance and Abundance at Lake Alfred.

This predator is one that seems to be sun loving. A very open grove or nursery that is heavily infested with aphids is usually the desired habitat. A nursery or grove in the vicinity of a truck crop section is also a common habitat. It seems as tho the beetle prefers truck crop aphids or conditions* and comes to citrus when the other aphids become scarce or disappear entirely. This lady beetle is the second most important lady beetle but probably the third most important predator. The second place must be given to the Syrphus fly, *Bacha clavata*,

TWO SPOTTED LADYBEETLE

Olla abdominalis sobrina Casey

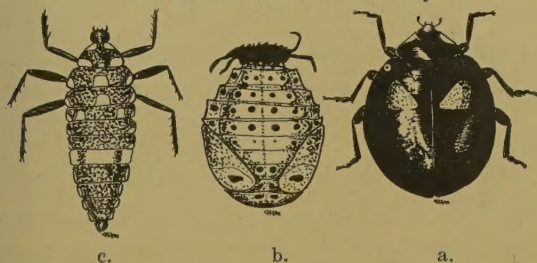


Fig. 5.—(From Bul. 183, Fla. Agri. Exp. Sta.)

*It is chiefly a southern species and ecologically belongs to the open fields rather than the forests. It is by far the most abundant lady beetle in the deserts and plains of the southwestern U. S.—Ed.

Description.—The adult beetles (Fig. 5a) are black in color with one fairly large irregular yellow spot on each wing cover. The eggs are cigar shaped, light yellow in color and laid in clusters of 4 to 20. Larvae (Fig. 5c) are black with yellow markings. The pupae (Fig. 5b) are black and white with a very elaborate pattern of black spots on the back.

Olla abdominalis var. *sobrina* Csy. (sym. *Coccinella oculata* Auct.), is a more or less common predator of the citrus aphid but not as common as the Blood-red or *Hippodamia convergens*. It has been observed working on citrus aphids as early as March and as late as November 15. It will feed on the Melon Aphid, *Aphis gossypii*, *Myzus persicae* and others.

Quite a few adults and larvae were observed feeding on mealy bugs that had infested guava. The adults, when caged, eat their own eggs much more readily than the Blood-red or *Hippodamia convergens*.

The time between the emergence of the adult and the egg laying period was not observed. Due to the adults eating their eggs and the high death rate from disease which also affects these beetles only one lot completed their life cycle. This is shown in the following table.

Date Eggs Dep. 1925	No. Eggs	Date Hatched	Date Pupated	Date Emerg'd	Life Cycle
4-9	10	4-13	5-6	5-12	33 days
4-10	7	4-14	----	-----	
4-10	7	4-14	----	-----	
4-11	10	4-15	----	-----	
4-13	12	No Hatch	----	-----	
4-14	12	4-17	----	-----	

During the winter months this lady beetle was hard to find but with the coming of spring it became quite abundant. It increased in numbers until about May 15, at which time it was the most abundant of all ladybeetles in aphid colonies at Lake Alfred. Since that time it has been present but not abundant.

Enemies.—No parasites have been reared from this predator but a fungus disease killed a great number of larvae during the springs of 1925 and 1926. It was very difficult to rear a larvae thru to the pupation period during that period.

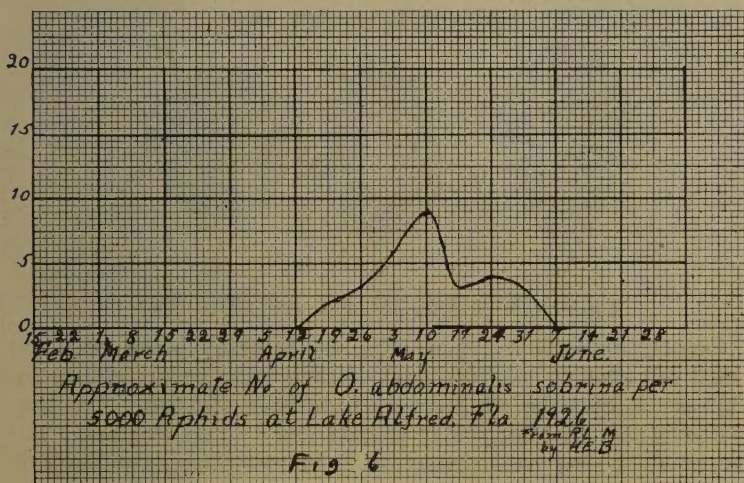


Fig. 6.—Graph Showing Seasonal Appearance and Abundance.

EXOCHOMUS MARGINIPENNIS CHILDRENI Muls.

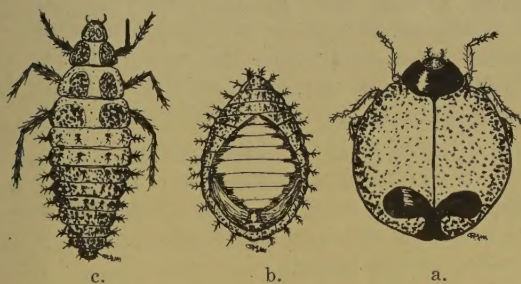


Fig. 7.—(From Bull. 183, Fla. Agri. Exp. Sta.)

Description.—This small lady beetle (Fig. 7a) is red in color and has an irregular black marking near the tip of each wing cover. The larvae (Fig. 7c) are gray and marked with yellow. The pupae (Fig. 7b) remains in the old larval skin which splits up the back at the time of pupation.

During the period when aphids were most abundant in the spring of 1926 and again in the summer, this beetle could be found but was at no time abundant enough to be of importance.

TWICE-STABBED LADYBEETLE

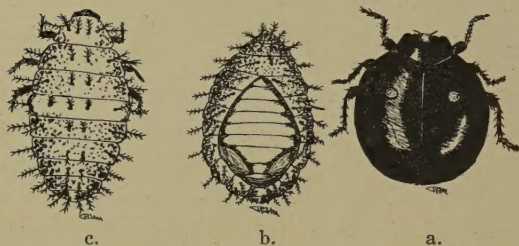
Chilocorus bivulneratus Muls.

Fig. 8.—(From Bull. 183, Fla. Agri. Exp. Sta.)

Description.—This beetle (Fig. 8) is shiny black with one small red spot on the fore part of each wing cover, giving the impression that the wing covers have been stabbed. The eggs are yellowish in color, cigar shaped and laid in clusters. The larvae (Fig. 8c) are covered with many spines, are black in color with a narrow yellow band across the back. When pupation takes place the larval skin splits and the pupa (Fig. 8b) remains inside the skin until the adult emerges.

Importance as Destroyers of the Citrus Aphid.—This ladybeetle is primarily a predator on scale-insects and attacks aphids only when in the vicinity of an infestation of scale. Both larvae and adults have been found eating aphids but this beetle cannot be considered an important beneficial factor in controlling the aphid, altho it may aid to some extent.

VEDALIA LADYBEETLE

(Rodolia cardinalis Muls.)

This common cottony cushion scale destroyer has been observed to eat aphids but a complete generation of beetles has not been reared on the aphid.

Microweisia coccidivora (Ashm.)

One specimen of this tiny red and black beetle was taken feeding on aphids at Temple Terrace during the spring of 1926. The anterior half of the elytra is reddish brown, the posterior black. It is about 1/25 of an inch long.

Ceratomegilla fuscilabris

Two specimens of this predator were found feeding on aphids during the spring of 1926; one at Fort Lauderdale, Fla., where the beetle was abundant on the turnip louse and one specimen at Lake Alfred, July 5.

apparently, not like *C. fuscilabris*. (Ent.)

The
FLORIDA ENTOMOLOGIST

Official Organ of The Florida Entomological Society, Gainesville,
Florida.

J. R. WATSON.....*Editor*
WILMON NEWELL.....*Associate Editor*
A. N. TISSOT.....*Business Manager*

Issued once every three months. Free to all members of the Society.

Subscription price to non-members is \$1.00 per year in advance; 35 cents per copy.

BOOK REVIEW

"The Heteroptera or True Bugs of Eastern North America with Especial Reference to the Faunas of Indiana and Florida," by Dr. W. S. Blatchley. Nature Publishing Co., Indianapolis.

Again Dr. Blatchley has produced a book of great value to those interested in insects. For years his Coleoptera of Indiana has been the most handy reference book for entomologists, who are not especially coleopterists, wishing to learn something concerning some beetle and especially its habits. More recently his (in collaboration with C. W. Leng) Rhyncophora or Weevils of North Eastern America and his Orthoptera of North-Eastern America have filled the same long-felt needs in their respective fields. For most of us who often find it difficult to keep up with the literature in one order or even one family of insects the amount of labor Dr. Blatchley has expended on these four books seems stupendous. One reads with regret that this book is to be his last of this nature; but he assures us that he will from time to time publish supplements to these works and also local lists of insects with full field notes. Indeed he has promised a paper in the last category for an early number of the Entomologist.

MEETINGS OF THE SOCIETY

The January meeting was called to order on the 13th at 4:00 p. m. by President Gray. Those present were: Members, Messrs. Gray, Grossman, Hubbell, Nolan, Merrill, Tissot, and Watson; Visitors, Messrs. M. R. Ensign and M. N. Walker. Mr. W. Miller was elected to membership.

Mr. Ensign gave a very interesting talk on the contributions of entomologists to agriculture.

The following officers of the society were elected for the 1927 session:

President, W. W. Yothers; Vice-President, T. H. Hubbell; Secretary-Treasurer, E. F. Grossman; Editor of the Florida Entomologist, J. R. Watson; Associate Editor, Wilmon Newell; Business Manager, A. N. Tissot.

Messrs. E. W. Berger, Goodwin, Gray, Grossman, Hubbell, Merrill, Nolan, Stone, Tissot, and Watson attended the regular meeting of the society, February 10, at 4:00 p. m. in Science Hall. Mr. M. R. Ensign was elected to membership and Drs. W. M. Barrows and H. T. Fernald were elected to honorary membership.

The society enjoyed a symposium on the meetings of the A. A. A. S. at Philadelphia and Southern Agricultural Workers at Atlanta. Messrs. Goodwin and Watson led in the discussion and many topics of interest were brought before the meeting.

February 24. The Society met in Professor Gray's laboratory in an especial evening meeting in honor of Dr. W. S. Blatchley of Dunedin and Indianapolis, an honorary member of the Society. Dr. Blatchley gave the members a very interesting account of his trip to South America, from Brazil to Peru. The general aspects of the insect fauna of the drier parts of South America seem to be very similar to those of the southwestern part of the United States.

March 10. The Society met in Science Hall at 4:00 p. m. Professor John Gray gave an interesting and instructive talk on his Christmas vacation trip to Cuba where he visited the main educational institutions as well as plantations. Prof. Gray found the science laboratories of Cuba well equipped.

E. F. Grossman, Secretary.

FACTORS DETERMINING NORTHERN LIMITS OF *ANTICARSIA GEMMATILIS*

Anticarsia gemmatilis is a noctuid moth whose caterpillar, commonly called the velvet-bean caterpillar, feeds extensively on velvet beans, *Stizalobium* sp., and also on soybeans, kudzu,

cannavalia and peanuts. The moths first appear in north central Florida, usually between the last of June and middle of August, and are to be found until January, altho their numbers rapidly diminish after November. The larvae have never been taken further north than Georgia and South Carolina. But the moths have been taken as far north as Ontario and have sometimes been quite abundant as far north as Pittsburgh. These captures in the northern states have all been in the autumn, from the last days of September into November, and undoubtedly have been migrants from the Gulf states. The ability to reach such far northern states as Canada is due to their longevity. Some moths kept in a case, 4' by 4' by 5', and fed on moistened sugar kept for five weeks. Doubtless under more natural conditions they would live even longer.

The object of this paper is to give the results of our inquiry into why it is not able to permanently establish itself in northern Florida and other southern states. This is not due to the direct action of cold. November 21, 1914 the temperature at Gainesville fell to 22 degrees, yet pupae lying exposed on the surface of the ground were not injured and moths were flying about as soon as the weather moderated. This is the lowest temperature the pupae will ever be exposed to under natural conditions in this latitude. But a heavy frost kills all the host plants of the larvae of this species, namely velvet beans, soybeans, kudzu, cannavalia and peanuts.

The pupal period is from ten to eleven days in September, but as the weather becomes colder it is lengthened until in November it is 21 days; and two individuals which pupated on November 20 and 21 respectively emerged on January 7; 47 and 48 days respectively.

The inability of the insect to permanently establish itself in northern Florida is due to its inability to tide over the starvation period of the caterpillars. In other words due to its inability to lie dormant during warm spells, in mid-winter. A 50 percent increase in the length of its pupal life would enable it to tide over this starvation period. In view of the immense lengthening of the pupal period during the cold weather, amounting to five times the period during warm weather, a rather small further lengthening would suffice.

Many laws have been promulgated to account for the geographical distribution of organisms. Among the factors which

have been considered important as limiting the distribution of organisms, the direct effect of temperature has been a favorite; such as the absolute, minimum, summation of effective temperature, etc. For most organisms most of these explanations are too simple. The factors limiting the distribution of an organism are doubtless varied and complex. In the case of *Anticarsia gemmatilis* the northern limits of its permanent range are determined not by the minimum temperature of the weather acting directly on the organism, not by any summation of effective temperatures, not by any direct action of the cold whatsoever, but by the effect of cold on the host plant of the larvae. Even this would not be effective were the insect able to remain dormant during comparatively a few weeks in winter. A comparative slight lengthening of its pupal life would enable the insect to do so.

OBITUARY

We have just learned of the death last May of Dr. Henry G. Branham of Deep Spring, Okahumpka, Fla., a member of our Society. Dr. Branham will be remembered by our readers as the author of a paper in our issue of August, 1925, on "Reclaiming Eden," a narrative of his successful attempt at controlling mosquitoes, largely by the use of top minnows, on his place at Deep Springs. The editor has visited his place at Deep Springs and was agreeably surprised at the degree of control achieved, and much interested in the methods used. Dr. Branham was during the World War an officer in the medical department of the American Expeditionary Forces in France.

ADDITIONS AND CORRECTIONS TO THE LIST OF THE CRAMBINAE OF FLORIDA

By GEO. G. AINSLIE

Bureau of Entomology, United States Department of Agriculture

Soon after the publication of my article on the Crambinae of Florida (Fla. Ent. 6:49-55, 1923) my attention was called by Mr. D. Marston Bates to Grosbeck's paper on the Lepidoptera of Florida (Bul. Am. Mus. Nat. Hist. 37:1-147, 1917) a publication which in some way had completely escaped my knowledge. Since I stated in my paper that several of the species in Grosbeck's list had not previously been reported from the state, it is only fair that this correction be made. Dr. Dyar's *Crambus trip-sacas* was also omitted from the first list.

In addition, Grosbeck records three species not in my list, thus increas-

ing to 41 the number of species known to occur in the state. For the convenience of those who do not have access to Grosbeck's paper and also to correct one or two inaccuracies in it, I have included in the following notes the species and localities not known to me at the former writing. Thus my previous paper and the present amendment contain all the distribution data we now have on this group in Florida.

Argyria lacteella Fab. Recorded by Grosbeck from Everglade in addition to previously reported localities.

Argyria nivalis Drury. Listed also from Everglade by Grosbeck.

Crambus decorellus Zinck. The credit for first reporting this species from the state should go to Grosbeck, who has records from Lakeland, La Belle, and Fort Myers.

Crambus mutabilis Clem. Listed by Grosbeck also from Lake Worth and Biscayne Bay.

Crambus quinqueareatus Zeller. Grosbeck lists *C. hastiferellus* Wlk. and *C. extorralis* Hulst, both of which, as I showed in my former paper, are incorrect determinations for the Florida species. He also lists a species as "*Crambus extorralis* Wlk." I can find no such species described by Walker and I am forced to assume that *C. extorralis* Hulst is meant. In this matter I am indebted to Dr. Dyar, of the National Museum, and to Mr. Heinrich, of the Bureau of Entomology, who kindly searched their records and corroborated my conclusion. Jacksonville is the only additional locality given.

Crambus satrapellus Zinck. Recorded by Grosbeck also from La Grange.

Crambus teterrellus Zinck. By some oversight omitted from my previous list, for have taken it at Lakeland, Orlando, and Fellsmere. First reported from the state by Grosbeck from Fort Myers, La Belle, and Everglade. There are also specimens in the National Museum from Archer and Fort Meade.

Crambus tripsacas Dyar. Described as new from specimens taken at Miami.

Diatraea differentialis Fern. Jacksonville, Everglade, and Biscayne Bay are additional localities given by Grosbeck for this species which he places under *Argyria*.

Dicymolomia pegasalis Wlk. First recorded from the state in Grosbeck's list. No additional localities are given.

Eoreuma densellus Zeller. Listed by Grosbeck in the genus *Chilo* but without additional locality records.

Eugrotea dentella Fern. Grosbeck gives Fort Myers as an additional record. Barnes and McDunnough list this species as a synonym of *E. incertella* Zinck.

Platytes squamulellus Zeller. First recorded from the state in Grosbeck's list as *Chilco squamulellus* with a record from Fort Myers in addition to those already given.

Prionapteryx nebuliera Steph. The doubt expressed in my previous paper as to the occurrence of this species in the state is dissipated by Grosbeck's record from Jacksonville where the larvae, in accordance with

their habit farther north, construct tubes of sand at the base of the plants of the Vacciniaceae, on which they feed.

Prionapteryx achatina Zeller. First recorded from the state by Grosbeck from specimens taken at Biscayne Bay by Mrs. Slosson.

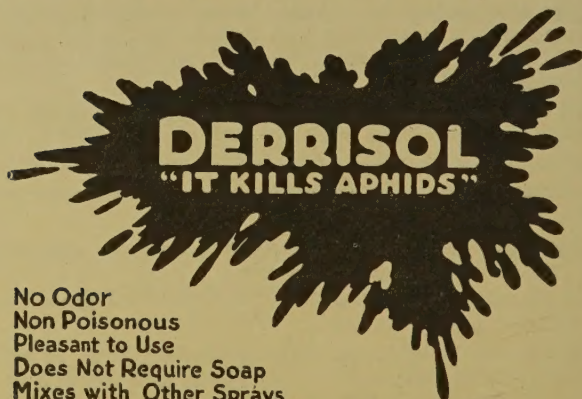
Thaumtopsia floridella B. & McD. Grosbeck lists this also from Punta Gorda.

Thaumtopsia pectinifer Zeller. Another addition to the state list. Recorded by Grosbeck from Lakeland.

WATCH THE RUST MITES

Rust mites are appearing rather earlier than their average date this season and citrus growers will do well to keep a sharp lookout in their groves. This early appearance is probably due to the unusual dry weather of the past spring. The citrus crop seems to be light this year and fruit should be kept bright in order that the growers should receive the full benefit of the short crop.

The New Spray for Aphis



No Odor
Non Poisonous
Pleasant to Use
Does Not Require Soap
Mixes with Other Sprays
Can be used with Hard or Soft Water

Costs Less than others

Made Only by

WILLIAM COOPER & NEPHEWS
CHICAGO

"BLACK LEAF 40"

(Sulphate of Nicotine—40% of Nicotine)

For liquid spraying against aphids, thrips, leaf-hoppers, etc. May be combined with other standard spray-chemicals. Always dependable and efficient.

"Black Leaf 40" is, in Very Truth, "The Old Reliable"

PRICES

½-lb. tin.....	\$ 1.25
2-lb. tin.....	3.50
10-lb. tin.....	13.50

"BLACK LEAF"-F1-NICOTINE DUST

Contains Over 1¼% of Actual ("Free") Nicotine

Made from our own high-strength ("Free") Nicotine. Thoroughly standardized as to strength and texture. Recommended for dusting vegetables to destroy aphids.

PRICES

F. O. B. Richmond, Va.

5-lb. tin.....	\$ 1.10
25-lb. drum.....	3.75
50-lb. drum.....	6.75
100-lb. drum.....	12.75

"BLACK LEAF"-F2-NICOTINE DUST

Contains Over 2% of Actual ("Free") Nicotine

Is stronger in nicotine than our—F1—Dust, but otherwise, is the same. Recommended against the more resistant insects, such as cucumber beetle, pea aphids, etc.

PRICES

F. O. B. Richmond, Va.

5-lb. tin.....	\$ 1.30
25-lb. drum.....	4.75
50-lb. drum.....	8.75
100-lb. drum.....	16.75

"Black Leaf" products are sold by seedsmen, hardware stores, drum stores, general merchants, and dealers in horticultural supplies.

ASK YOUR DEALER

**TOBACCO BY-PRODUCTS & CHEMICAL
CORPORATION**

(Incorporated)

LOUISVILLE, KENTUCKY

Now is the time to spray trees affected with rust mite, scab or melanose. We handle the

DRY LIME SULPHUR

It saves freight on water and expense of handling. Shipped in air-tight packages with removable top. Will keep indefinitely if top is replaced after using. Dissolves readily in any water. Add Dry Lime Sulphur to water and stir. Five pounds to one hundred gallons water for rust mite, equivalent to two gallons 33° Lime Sulphur Solution to one hundred gallons of water. Prices range from 10½ to 25c per pound according to quantity order.

Arsenate of Lead

Bluestone

Bordeaux Mixture

Genuine Protexol

Caustic Soda

Schnarr's Spray Formula

Carbolic Acid, Crude

Copperas

Fish Oil Soap

Soluble Sulphur Compound

Sulphur Flowers, etc.

Target Brand White Fly Destroyer.

Fresh stock of goods always on hand.

IN OUR SPRAYING DEPARTMENT

we carry only the best and most reliable, such as Leggett's Champion Duster, Lowell Compressed Air Sprayers and Gould Sprayers. Write for booklet and prices.

E. O. PAINTER FERTILIZER CO., Jacksonville, Fla.

Printing for All Purposes

Carefully Executed

Delivered on Time

Pepper Printing Company.

Gainesville, Florida

We recommend the goods advertised in The Florida Entomologist. Please mention Entomologist when you write our advertisers.